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Short Communication

Polycross progeny test for fodder yield in alfalfa (*Medicago sativa* L.)

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Alfalfa (*Medicago sativa* L.), known as queen of forages, is the most productive perennial forage legume. Because of its small-size flower, hand pollination is difficult and thus, polycross progeny test is appropriate to test the general combining ability (*gca*) for developing synthetic varieties [1].

In the present experiment, 15 plants of alfalfa were selected on the basis of plant vigour and synchronisation in flowering for estimating *gca* effects from landraces germplasm collection of Rajasthan. One clone of each line was surrounded by clones of other lines to facilitate random mating through open pollination in circular plots of a polycross nursery developed in *Rabi* 1999-2000 with clones of these 15 lines. Each clone was replicated 15 times in this fashion. Seeds of clone from the middle in the circular plot were harvested separately for each line and from these seeds polycross progenies for 15 lines were grown in randomised block design with three replications during *Rabi* 2000-2001. Observations for different fodder yield components were taken on 25 plants in each replication for each line. However, data on green fodder as well as dry fodder yield per plant was taken as total over three cuts (first cut was taken 60 days after sowing and subsequently second and third at 30 days interval). Mean values were subjected to analysis of variance as per standard statistical procedure [2]. The *gca* effect of a line was estimated as difference of progeny mean of that line over replication and grand progeny mean over replication and line. Considering $\sigma^2_{gca} = 1/4\ \sigma^2_A$ in polycross progeny, additive genetic variance (σ^2_A) was estimated and then coefficient of variation (CV) (%) for additive genetic component was estimated as σ_A/μ X 100.

Analysis of variance revealed significant differences in general combining ability among the lines for all the characters studied (Table 1) indicating the scope of selection of lines with high *gca* for evolving synthetic variety. Among the 15 lines, seven lines (line 1, 3, 4, 6, 7, 11 and 13) showed relatively higher *gca* effects for all fodder attributes (Table 2). Four (line 8, 10, 14 and 15) were very poor combiners as they showed negative *gca* effects for most of the fodder yield components. Other four lines exhibited low to moderate *gca* effects for different traits.

Ratio of leaf to stem exhibited the highest additive genetic CV (55.26%). Number of leaves per plant (31.55%) and branches per plant (32.02%) also showed relatively higher additive genetic CV. Plant height (14.72%), green fodder (15.14%) and dry fodder yield per plant (16.13 %) had moderate genetic CV. Leaf length (8.57 %) and leaf breadth (9.70%) showed low additive genetic CV.

Among the seven good combiners, five lines (line 1, 3, 7, 11 and 13) showed all positive *gca* effects for all the components (Table 2). Furthermore, the line 1

Table 1. Analysis of variances for 15 polycross progenies for different fodder yield components in alfalfa

Sources of variation	Mean squares							
	Plant height (cm)	Leaves/plant	Leaf length (cm)	Leaf breadth (cm)	Leaf:stem ratio	Branches/ plant	Green fodder yield/ plant (g)	Dry fodder yield/plant (g)
Replication	14.29	4.73	0.05	0.02	0.01	1.02	8.34	0.70
GCA	52.46**	98.73**	0.07**	0.03*	0.10**	4.07**	19.54**	1.27**
Error	4.96	6.96	0.01	0.01	0.02	0.92	3.02	0.30

*,** Significant at 5% and 1% level of significance, respectively

Table 2. General combining ability effects for fodder attributes of 15 lines in alfalfa

Lines	Plant height (cm)	Leaves/ plant	Leaf length (cm)	Leaf breadth (cm)	Leaf : stem	Branches/ plant	Green fodder yield/plant (g)	Dry fodder yield/plant (g)
1	13.56	10.48	0.12	0.04	0.09	1.58	15.69	3.09
2	0.21	3.33	–0.16	0.01	0.01	–0.52	2.94	0.60
3	10.03	4.68	0.32	0.20	0.02	1.10	15.42	3.50
4	4.93	0.62	0.02	0.08	0.01	–0.65	0.24	–0.03
5	0.32	1.20	–0.16	0.02	–0.14	–1.25	0.14	0.20
6	7.65	–7.38	0.16	0.10	0.07	–1.30	3.17	0.61
7	3.25	8.33	0.11	0.23	0.08	1.40	12.87	2.26
8	–10.22	–10.66	–0.06	–0.18	–0.19	–.09	–20.67	–4.75
9	–10.93	0.66	0.02	–0.01	–0.11	0.02	–5.79	–0.93
10	–13.03	–9.22	–0.17	–0.15	–0.17	–1.19	–17.76	–3.16
11	8.20	6.65	0.10	0.07	0.20	1.75	12.96	2.70
12	1.08	3.11	–0.08	–0.11	0.02	–0.09	4.91	1.08
13	6.81	8.12	0.06	0.06	0.09	2.45	9.96	1.61
14	–9.68	–9.78	–0.16	–0.08	0.01	–1.12	–18.27	–3.03
15	–12.18	–10.14	–0.12	–0.12	0.01	–1.09	–15.81	–3.75

showed the highest *gca* effect for plant height, number of leaves per plant and green fodder yield per plant; line 3 was the best combiner for leaf length and dry fodder yield per plant, whereas lines 7, 11 and 13 had the highest *gca* effect for leaf breadth, ratio of leaf to stem and number of branches per plant respectively. Thus, these superior five lines may be used to develop a high performing synthetic variety for increased fodder yield in alfalfa.

References

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